

PATENT SPECIFICATION

1,015,516

1,015,516



Inventors: BENJAMIN KECK DAUBENSPECK, REX EUGENE DICKY, DONALD STEELE FOOTE, and JUSTIN HANSON WHIPPLE.

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SCIENCE

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COMPLETE SPECIFICATION

DRAWINGS ATTACHED

U. S. PATENT OFFICE

Improvements in or relating to Firearm Cartridges

We, REMINGTON ARMS COMPANY, INC., a corporation organized under the laws of the State of Delaware, one of the United States of America, of 939 Barnum Avenue, Bridgeport, Zone 2, State of Connecticut, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention relates to firearm cartridges, and is concerned with centerfire types of cartridges.

- 15 According to the present invention there is provided a firearm cartridge comprising a plastics casing including an annular wall, a rigid head including an extractor rim and a primer positioning battery cup, means
- 20 fastening said head to said casing, a plastics shot container within said casing, said shot container comprising a transverse base wall, an annular wall integral with said base wall including a circumferentially continuous gas
- 25 sealing skirt portion extending rearwardly from said transverse wall and an expansible portion extending forwardly therefrom and having a plurality of circumferentially spaced longitudinal slits extending from
- 30 its forward end into contiguous relation to said transverse wall, shot within said shot container and entirely separated from the first-mentioned annular wall by said container, and releasable closure means normally
- 35 retaining said shot and said shot container in said casing.

For a better understanding of the present invention and to show how the same may be carried into effect reference will now be made, by way of example, to the accompanying drawings, in which:—

Fig. 1 is a longitudinal sectional view of a shotgun cartridge casing and head, wherein

[Price 4s. 6d.]

the head is secured by insert injection moulding to the casing;

Fig. 2 is an end elevation as seen from the right in Fig. 1;

Fig. 3 is an end elevation as seen from the left in Fig. 1;

Fig. 4 is an end elevation showing the forward side of the head in its form as die cast;

Fig. 5 is a sectional view of the head taken along the line 5-5 of Fig. 4;

Fig. 6 is a sectional view showing the die cast head shaped by swaging prior to assembly by insert injection molding to the casing;

Fig. 7 is a sectional view similar to Fig. 1 showing a modified interlocking rim formation provided upon the head;

Fig. 8 is a sectional view taken along the line 8-8 of Fig. 9, showing a modified form of head secured by insert injection molding to the casing;

Fig. 9 is an end elevation as seen from the left in Fig. 8;

Fig. 10 is a sectional view taken along the line 10-10 of Fig. 11 showing another modified head formation secured by insert injection molding to the casing;

Fig. 11 is an end elevation as seen from the left in Fig. 10;

Fig. 12 is a sectional view taken along the line 12-12 of Fig. 13, showing still another modified head formation secured by insert injection molding to the casing;

Fig. 13 is an end elevation as seen from the left in Fig. 12;

Fig. 14 is a sectional view showing another modified head formation secured by insert injection molding to the casing;

Fig. 15 is a view partially in side elevation and partially in section showing still another modified head and casing formation, wherein the casing is secured to the head by snap

engagement therewith, the parts being shown in separated relation;

Fig. 16 is a sectional view showing the head and casing as illustrated in Fig. 15 in their assembled relation;

Fig. 17 is a longitudinal sectional view of a complete loaded shot gun cartridge, including a shot container capsule, the illustrated head and casing being similar to that shown in Fig. 1;

Fig. 18 is a transverse sectional view taken along the line 18-18 of Fig. 17;

Fig. 19 is a transverse sectional view taken along the line 19-19 of Fig. 17;

Fig. 20 is a side elevation of the shot container capsule, as employed in the cartridge illustrated in Fig. 17, the same being shown in its normal position for fitting within the casing;

Fig. 21 is a side elevation showing the manner in which the shot container capsule illustrated in Fig. 20 is flared or distorted as it is discharged from the firearm barrel following firing from the cartridge;

Fig. 22 is an enlarged fragmentary view partially in side elevation and partially in longitudinal section of the closure end of the cartridge illustrated in Fig. 17;

Figs. 23, 24 and 25 are views similar to Fig. 22 showing modified forms of closure ends;

Fig. 26 is a fragmentary sectional view taken along the line 26-26 of Fig. 27 of another modification in which a die cast head is secured to the casing by swaging;

Fig. 27 is an end elevation as seen from the left in Fig. 26;

Fig. 28 is a view partially in side elevation and partially in longitudinal section showing a modified form of head secured to the casing by swaging;

Fig. 29 is a fragmentary longitudinal sectional view taken along the line 29-29 of Fig. 30 of another modified head formation secured by swaging to the casing and provided with a plastics overlay;

Fig. 30 is an end elevation showing the inner end of the head as illustrated in Fig. 29;

Fig. 31 is a fragmentary longitudinal sectional view taken along the line 31-31 of Fig. 32 of another modified head formation secured by swaging to the casing and having a plastics overlay;

Fig. 32 is an end elevation as seen from the left in Fig. 31;

Fig. 33 is a longitudinal sectional view of the head and overlay as illustrated in Figs. 31 and 32 shown in separated relation to the loaded casing, the dot-and-dash lines showing the assembled relation of the head and overlay with the casing;

Fig. 34 is an end elevation on an enlarged scale of the closure end of the casing shown in Fig. 33;

Fig. 35 is a sectional view taken along the line 35-35 of Fig. 34, and showing in dot-and-dash lines the open position of the closure end of the casing following firing;

Fig. 36 is a sectional view taken along the line 36-36 of Fig. 34;

Fig. 37 is a diagram showing the steps of the method of manufacturing and assembling cartridges such as those shown in the previous Figures; and

Fig. 38 is a diagram of a modification of the method.

Figs. 1-36 of the drawings show center fire type cartridges. Methods of manufacture and assembly of these cartridges are illustrated diagrammatically in Figs. 37 and 38. The cartridges shown come under two categories:—(1) wherein the primed head is assembled with the plastics body during formation thereof, loading of the cartridge taking place after assembly, and (2) wherein the primed head is mechanically assembled with the preformed plastics body. In the second category the body may be loaded prior to assembly through the open head end thereof, the forward end being provided with a load retaining closure prior to loading.

Referring to Figs. 1-7 of the drawings, the shotgun cartridge which is shown in its unloaded condition, comprises a rigid head 10 of high compressive strength material, preferably produced by die casting, and a molded plastics body 11 which is injection molded and simultaneously assembled with the head as an insert in the molding die, a primer cup 22 being assembled with the head prior to the insert molding operation, as will presently more fully appear. The material of the head is preferably zinc die casting alloy, although other materials may be utilised. The head 10 comprises an annular base wall 12 provided at its outer periphery with a bevelled extractor rim 13 and at its inner periphery with a cylindrical wall constituting a battery cup 14 having an integral transverse web 15 inwardly spaced from its forward end and provided with vent holes 16-16 and an integral centrally disposed tapered anvil 17 projecting rearwardly therefrom.

The extractor rim 13 is provided inwardly of its annular bevelled surface with a forwardly facing flat annular ledge 18, and with an annular lip 19 which curves inwardly with respect to the inner wall of the rim for interlocking cooperation with the plastics body, as will presently more fully appear. The forward end of the cylindrical wall of the battery cup 14 is provided with an outwardly curved annular flange 20, also for interlocking cooperation with the plastics body. In die casting the head, identifying legends, trademarks, or the like may be cast in its outer surface in the form of indenta-

tions, a pair of concentric circular indentations 21 being illustrated by way of example.

The primer cup 22 contains a priming composition 23 and is assembled within the battery cup 14 prior to assembly of the head with the body. As illustrated in Figs. 4 and 5 the rim 19 and the forward flange 20 of the battery cup 14 are die cast in straight relation in accordance with economical die casting methods, and are thereupon formed into their curved shapes as shown in Fig. 6 by suitable dies. This operation may be performed in the same machine which assembles the primer cup with the head.

The plastics body 11 is of generally cylindrical tubular form and is interlocked with the head 10 by insert injection molding, the head being inserted in the injection molding die in such relation to the core of the die that the plastics material is molded into conforming interlocking relation with the forward surfaces on the head, the internal surfaces of the plastics body being so shaped that the core of the die may be removed by a straight draw movement of the core. At the head end, the body is thickened as at 25 to encompass the inwardly curved lip 19 with its outer cylindrical surface carried to the inner edge of the annular bevelled surface of the annular rim 13, so that outwardly of the lip 19 the rearward edge of the body engages the annular ledge 18. From the thickened portion 25 encompassing the lip 19 the plastics material of the body extends as an overlay 26 over the forward surface of the wall 12 of the head and in surrounding relation to the annular wall of the battery cup 14, the outwardly curved forward end portion 20 of the wall being in interlocking abutting relation to the forward edge of the overlay. Thus the inner surface of the head is provided with a plastics overlay, the body is firmly interlocked with the head, and the substantial surface engagement of the overlay with the head between the forward edge of the battery cup 14 and the extractor rim 13 establishes an effective gas seal.

In Fig. 7 there is shown a modification in which the interlocking lip 19a is curved outwardly. The structure of this modification can be formed conveniently by a die casting apparatus utilizing a lateral slide mechanism to form the undercut portions.

In the modification illustrated in Figs. 8 and 9, the head 10 comprises an annular ring-like base wall 27 integral with the bevelled rim 13 and connected to the battery cup 14 in outwardly spaced concentric relation thereto by a plurality of radial spoke portions 28 inclined outwardly and rearwardly preferably at an angle of approximately 45°, from a point rearwardly spaced a slight distance from the forward end of the battery cup to the base wall 27. The plastics body or casing 11 is thickened as at 29

adjacent the head, and is carried inwardly over the forward sides of spoke portions 28 to the forward end of the battery cup in the form of a circumferentially continuous overlay 30 and is carried between the spokes into flush relation with the rearward surface of the base wall 27 to form an exposed ring 31 of plastics material disposed between the base wall and the battery cup. The arrangement provides an effective interlocking relation between the head and the casing and an effective gas seal. The reinforcing mass of plastics interengaged with the spoked head enables a substantial reduction of the metal employed in the head.

In Figs. 10 and 11 there is illustrated a modification of the spoked head arrangement illustrated in Figs. 8 and 9, wherein a plurality of radial spoke portions 32 extend between the battery cup 14 and the bevelled extractor rim 13 with their rearward surfaces flush with the rearward surfaces of the battery cup and the rim. Their forward surfaces are substantially L-shape in cross section and extend inwardly from a flat annular ledge surface 33 of the extractor rim and forwardly along the cylindrical wall of the battery cup 14 to an outwardly extending flange 34 provided at the forward end of the battery cup. The plastics body is provided with a thickened portion 35 adjacent to the head which abuts the ledge 33 and is carried as a circumferentially continuous overlay 36 over the inner surfaces of the spokes and forwardly over the flange 34, being carried between the spokes, as at 37, into flush relation with the rearward surfaces of the extractor rim 13 and the battery cup 14.

In the modification illustrated in Figs. 12 and 13 the head 10 comprises a base wall 38 substantially thicker than the base wall of the embodiment shown in Figs. 1-6, its forward surface being flush with the inner edge of the bevelled surface of the extractor rim 13. A plurality of equally spaced rearwardly divergent rivet holes 39 is provided in the base wall 38 between the battery cup 14 and the extractor rim 13 into which are molded interlocking rivet portions 40 of the plastics body, these rivet portions extending into the holes 39 from an overlay portion 41 into flush relation with the rearward surface of the base wall 38.

In Fig. 14 there is illustrated a modification in which the base wall 42 of the head 10 is somewhat similar in its thickness dimension to the base wall 38 of the embodiment shown in Figs. 12 and 13, but it is not provided with rivet holes for interlocking the casing. The plastics body 11 is provided with an overlay portion 43 which extends over the forward surface of the wall 42 and forwardly in surrounding relation to the battery cup 14, the latter being provided externally with a shoulder 44 in relation to

which the overlay is interlockingly molded.

The modification illustrated in Figs. 15 and 16 is substantially similar in structure to that illustrated in Fig. 14, but in this case the battery cup 14 is provided with a bevelled shoulder 45, and the plastics body 11 is provided with an overlay portion 46 having an annular recess 47 for interlocking engagement by the bevelled flange 45. Unlike the modifications illustrated in Figs. 1-14 where the head constitutes an insert during the injection molding of the body, the body in the modification of Figs. 15 and 16 is separately molded with the overlay portion 46 inclined slightly forwardly from the outer surface of the body. The plastics material has sufficient resilience or elasticity so that the plastics body may be snapped into interlocking relation with the head, the overlay portion 46 thereupon assuming a flat position in snug engagement with the forward surface of the head as shown in Fig. 16.

In Figs. 17-22 the shotgun cartridge is shown provided with a plastics shot container or capsule 49 which is adapted to be fired from the cartridge with the shot for the purpose of better controlling the shot pattern, minimizing shot distortion, and preventing leading of the firearm barrel. While the shot capsule may be incorporated in the various modified forms of the shotgun cartridge it is illustrated by way of example as being embodied in the modification illustrated in Figs. 1-6. The capsule comprises a transverse wall 50 provided with a rearwardly extending skirt 51 against which a wad 52 engages, the powder charge 53 being disposed rearwardly of the wad. A relatively thin cylindrical wall 54 extends forwardly from the transverse wall 50 and is preferably slightly tapered in thickness towards its forward end. A plurality of longitudinal circumferentially spaced slits 55 are provided in the wall 54 extending from its forward end to a point contiguous to the transverse wall 50. These slits provide a series of leaf-like portions which upon forward propulsion from the firearm barrel spread into an open position substantially as shown in Fig. 21. The skirt 51 functions as a gas-sealing wad.

The capsule 49 is filled with shot 56 and these are retained in the cartridge by a closure cap 57. The closure cap as illustrated in detail in Fig. 22 is adapted to be snapped into engagement with the body, and for this purpose is provided with a flange rim 58 having an internal recess 59 which is adapted to snap into engagement with a shoulder projection 60 of an annular recess 61 in the end of the body. A series of grooves 62 at the inner side of the cap adjacent the rim 59 provide a circumferential weakened line which under the force of the gases produced in the explosion of the cartridge permits the closure cap to break away from the rim 58.

In Fig. 23 the closure cap 57 is provided with a rim flange 63 having sliding engagement with an annular recess 64 in the end of the body, and which is secured by cementing the contacting surfaces of the rim and recess as at 65. An annular groove 66 in the inner side of the closure cap adjacent the rim provides a weakened line for separation of the closure cap from its rim.

In Fig. 24 the closure cap 57 is snapped into place behind an inwardly projecting bead 67 at the forward end of the body.

In Fig. 25 the body is provided with a folded-in closure end 68 of the type as disclosed in Patent No. 531,203. A disk 69 is secured to the forward side of the folded-in closure by adhesive 70, and a separation disk 71 is preferably provided between the shot 56 and the folded-in closure.

In the modification illustrated in Figs. 26 and 27 a transverse base wall 72 extends outwardly from the forward end of the battery cup 14 to an outer cylindrical wall 73 extending forwardly from the extractor rim 13, a plurality of radially extending ribs or spokes 74 being provided between the battery cup and inner side of the wall 73 to provide a reinforced rigid lightweight head structure in which the cut out pockets 75 between the ribs 74 minimize metal usage. An annular skirt portion 76 extends forwardly from the outer wall 73 and an annular skirt portion 77 extends forwardly from the base wall 72 and define between them an annular recess 78 in which the end of the cylindrical plastics body 11 is engaged and clamped by expanding the inner skirt portion 77 outwardly, as indicated by the arrows. This operation is preferably performed by means of a suitable punch, preferably shaped with a 45° entrance angle, the outer annular skirt portion 76 being at the same time supported in a suitable die.

The arrangement provides an effectual obturating gas seal. Also, the integral battery cup and anvil which are adapted to have the primer cup assembled with the head prior to assembly of the body therewith eliminates the conventional base wad, anvil, battery cup and associated assembly operations for these components.

In Fig. 28 the head 10 is substantially similar to that shown in Figs. 26 and 27, but in this case the outer skirt 79 is shortened so that its forward end does not project beyond the forward end of the inner annular skirt 77. The end of the cylindrical plastics body 11 is engaged in the annular recess 78 and clamped by swaging the outer annular skirt 79 inwardly, as indicated by the arrows.

In the modification illustrated in Figs. 29 and 30 the head 10 is provided with a base wall 80 flush with the extractor rim 13 and having a forwardly extending annular wall portion 81 provided with a central cylindrical

passage 82 which forms a forward continuation of the battery cup 14. An annular series of cylindrical pockets 83 in the wall portion 81 extend from its forward surface to the base wall 80 and serve to reduce weight and minimize metal usage. A plastics cup shaped overlay 84 is secured upon the forward end of the head preferably by insert injection molding, the overlay being interlocked with the head by means of a plurality of lugs 85 provided about the forward end of the passage 82. An outer annular skirt 86 extends forwardly from the extractor rim 13 in concentric spaced relation to the wall portion 81 and provides an annular recess in which the end of the plastics body 11 is engaged and clamped by swaging the forward end portion of the skirt 86 inwardly, as indicated by the arrows.

The modification illustrated in Figs. 31 and 32 is substantially similar to that illustrated in Figs. 29 and 30, but in this case the head 10 is provided with a series of pockets 87 in reverse arrangement to the pockets 83, being extended forwardly from the rear face of the head. Instead of the lugs 85 an outwardly curved flange 88 is provided for interlocking connection of the plastics overlay 84.

The modifications as illustrated in Figs. 28-32 are adapted for the assembly of the primed head following the loading of the body 11. In carrying out this operation the forward end of the body can be provided with a closure which may be similar to those illustrated in Figs. 22-25, or it may be provided with an integral frangible closure as illustrated in Figs. 33-36. This closure consists of an integral end wall 89 provided with radial grooves 90 extending from its center to its outer edge to form a series of weakened lines, which, upon firing of the cartridge, break and allow the sections of the closure to be forced forwardly as indicated by the dot-and-dash lines in Fig. 35.

The manner of assembly of the head with the loaded body is illustrated in Fig. 33, the head being shown by way of example as the modification illustrated in Figs. 31 and 32. The body is provided with shot 91, wads 92 and a powder charge 93. With the body in vertical position with its closure end downwardly, the head 10 provided with the plastics overlay 84 is assembled with the upwardly disposed open end of the body, as indicated by the dot-and-dash lines, and is thereupon secured by swaging in the outer skirt portion 86 in the manner indicated by the arrows in Fig. 31.

In Figs. 37 and 38 methods of manufacture and assembly of cartridges are illustrated diagrammatically. The method as illustrated in Fig. 37 comprises a first sequential arrangement, consisting of a head forming machine, for instance a die casting machine,

and a head priming machine, a second sequential arrangement in theoretically parallel or collateral relation to the first sequential arrangement, consisting of a casing molding machine and a casing loading machine, and a third sequential arrangement, consisting of an assembly machine and a packing machine, wherein the primed heads and loaded casings are assembled and the completed cartridge packed. The product of this method is exemplified by the cartridge modifications illustrated in Figs. 28-33.

The method illustrated in Fig. 38 comprises the sequential arrangement of a head forming machine, a priming machine, a casing molding machine wherein the head is attached to the casing by insert molding, a casing closing machine, and a packing machine for receiving the completed cartridge. The product of this method is exemplified by the cartridge modifications illustrated in Figs. 1-25.

In all the cartridges described hereinbefore, the plastics body or casing is of plastics material having high tensile strength and controlled flexibility under expansive pressure. Linear polyethylene and copolymers of ethylene and other alpha olefins have been found to be highly satisfactory in performance. Other suitable plastics materials which have given satisfactory results are ethyl cellulose, cellulose acetate, styrene butadiene, and styrene butadiene acrylonitrile terpolymer. Such materials are capable of formation into desired cross-sectional shapes by economical moulding procedures, for example, injection moulding for independent formation of the casing, as well as insert injection moulding for the simultaneous moulding of the casing and the attachment thereto of associated metallic parts of the cartridge.

WHAT WE CLAIM IS:—

1. A firearm cartridge comprising a plastics casing including an annular wall, a rigid head including an extractor rim and a primer positioning battery cup, means fastening said head to said casing, a plastics shot container within said casing, said shot container comprising a transverse base wall, an annular wall integral with said base wall including a circumferentially continuous gas sealing skirt portion extending rearwardly from said transverse wall and an expandible portion extending forwardly therefrom and having a plurality of circumferentially spaced longitudinal slits extending from its forward end into contiguous relation to said transverse wall, shot within said shot container and entirely separated from the first-mentioned annular wall by said container, and releasable closure means normally retaining said shot and said shot container in said casing.

2. A firearm cartridge as claimed in

claim 1, wherein the casing is of plastics material having high tensile strength, and controlled flexibility under expansive pressure, and wherein the head is a thin rigid head of zinc die casting alloy.

3. A firearm cartridge as claimed in claim 1 or 2, wherein said head includes a body having the extractor rim projecting laterally therefrom and the primer positioning battery cup projecting forwardly from said body to a position within said plastics casing, and a short circumferentially continuous lip extending forwardly from near the peripheral portion of said body in the direction of the wall of said plastics casing for a distance not substantially more than the maximum thickness of said plastics casing and curved over to define a re-entrant flanged surface facing said body; and wherein an integral part of said plastics casing completely encases said lip and engages the forward face of said body in engagement with the periphery of said battery cup thereby to interlock said head and said casing.

4. A firearm cartridge as claimed in claim 3, wherein said battery cup is provided with a circumferentially continuous flange curved outwardly with respect to the longitudinal axis of the cartridge and in engagement with that portion of the plastics casing in engagement with the periphery of said battery cup.

5. A firearm cartridge as claimed in claim 3 or 4, wherein said battery cup is provided with an integral anvil for co-operation with the primer.

6. A firearm cartridge as claimed in claim 3, 4 or 5, wherein said lip is curved inwardly with respect to the longitudinal axis of the cartridge.

7. A firearm cartridge as claimed in claim 6, wherein said battery cup is provided with a circumferentially continuous flange curved outwardly with respect to the longitudinal axis of the cartridge and in engagement with that portion of the plastics casing in engagement with the periphery of said battery cup.

8. A firearm cartridge as claimed in any one of claims 3 to 7, wherein said casing is interlocked with said head by injection moulding said casing with said head supported as an insert in the moulding die.

9. A firearm cartridge as claimed in any one of the preceding claims, wherein said means fastening said head to said casing includes connecting means defining circumferentially spaced openings in said metallic body into which integral parts of said casing are interlockingly moulded.

10. A firearm cartridge as claimed in claim 9, wherein overlay means integrally moulded with said casing extend from the annular wall of said casing over the forward side of said connecting means into engage-

ment with said battery cup.

11. A firearm cartridge as claimed in claim 9 or 10, wherein said circumferentially spaced openings are defined by a plurality of evenly spaced radially extending spoke-like members interconnecting said extractor rim and said battery cup, the interlockingly moulded portion of said casing extending through said openings into a common plane with the face of said body remote from that portion of the casing defining the annular wall.

12. A firearm cartridge as claimed in claim 11, wherein said spokelike members are inclined outwardly and rearwardly from the portion of said battery cup within said plastics casing to said extractor rim to provide an annular space in surrounding relation to the rearward end of the battery cup, there being a plastics ring integral with the remainder of said interlockingly moulded plastics casing within said annular space.

13. A firearm cartridge as claimed in claim 9 or 10, wherein said circumferentially spaced openings in said metallic body are in the form of rearwardly divergent rivet holes passing through said metallic body and filled with integral portions of said casing.

14. A firearm cartridge as claimed in claim 1, wherein said rigid head includes a disc-like metallic body having an extractor rim and a primer positioning battery cup projecting forwardly from said head and a diametrically enlarged formation on and integral with the exterior of said battery cup, said means for fastening said head to said casing including an integral part of said casing overlaying and in engagement with the forwardly facing surface of said body and having an opening interlockingly engaged with the periphery of said battery cup and with said diametrically enlarged formation thereon.

15. A firearm cartridge as claimed in claim 14, wherein said diametrically enlarged formation on the battery cup is formed to define a forwardly and inwardly tapered surface having at its forward end a diameter less than that of said opening in said casing and at its rearward end a diameter greater than that of said opening, whereby said battery cup with the enlarged formation thereon may be inserted into said opening and forced therethrough to have a resilient snaplike engagement with said casing, the rearward end edge of said diametrically enlarged portion being so disposed forwardly of said disc-like body as to overlay and engage a portion of the inner surface of the integral part of said casing engaging said body.

16. A firearm cartridge as claimed in any one of preceding claims, wherein a primer is disposed in said battery cup.

17. A firearm cartridge substantially as

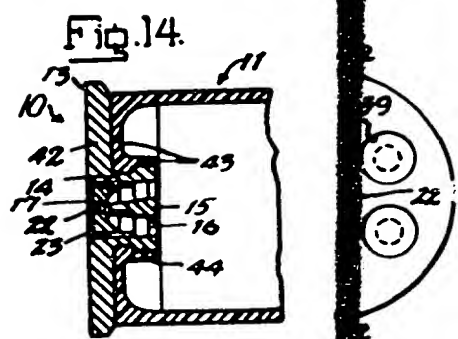
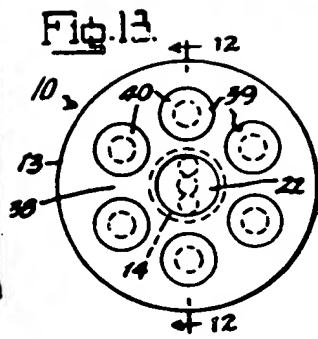
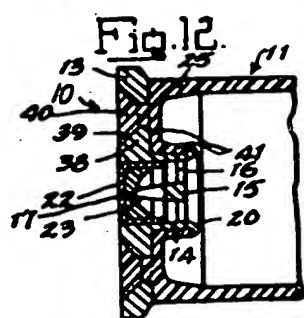
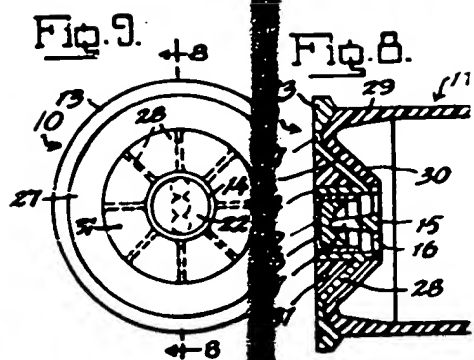
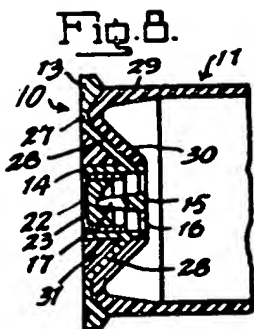
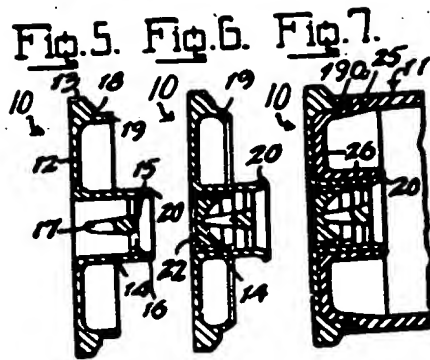
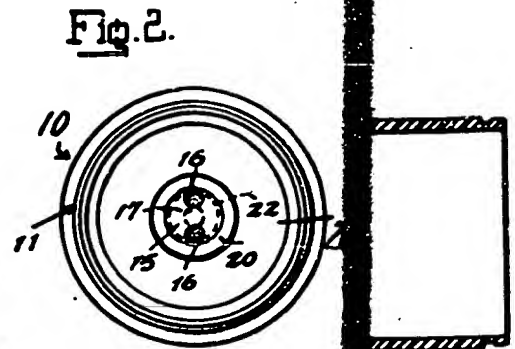
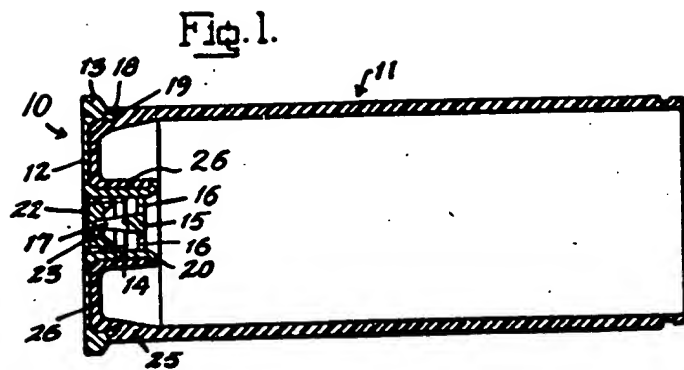
hereinbefore described with reference to Figs. 1 to 6 and 17 to 22 and with either Fig. 23 or Fig. 24 or Fig. 25; all with or without the modification of Fig. 7 or that of either
5 Figs. 8 and 9 or Figs. 10 and 11 or Figs. 12 and 13 or Fig. 14 or Figs. 15 and 16 or Figs. 26 and 27 or Fig. 28 or Figs. 29 and 30 or Figs. 31 and 32, of the accompanying drawings.

10 18. A firearm cartridge substantially as hereinbefore described with reference to

Figs. 1 to 6, 17 to 22 and 33 to 36; all with either Figs. 26 and 27 or Fig. 28 or Figs. 29 and 30 or Figs. 31 and 32, of the accompanying drawings.

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HASELTINE, LAKE & CO.,
Chartered Patent Agents,
28 Southampton Buildings,
Chancery Lane,
London, W.C.2.
Agents for the Applicants.



1,015,516 COMPLETE SPECIFICATION

4 SHEETS

This drawing is a reproduction of the Original on a reduced scale.

SHEET 1

Fig. 2.

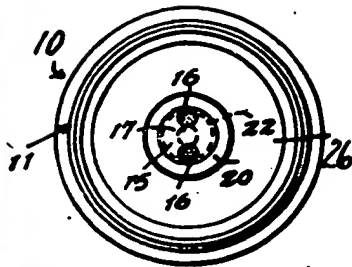


Fig. 3.

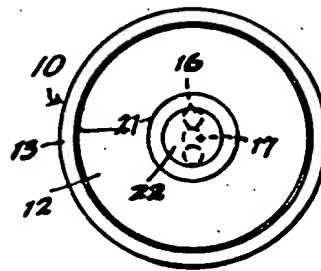


Fig. 4. 5+

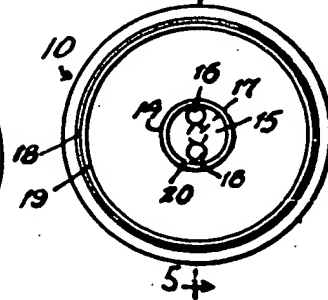


Fig. 8.

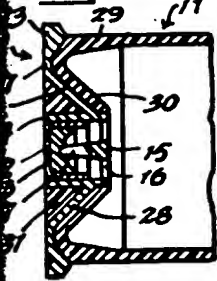


Fig. 9.

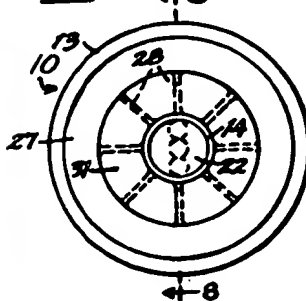


Fig. 10.

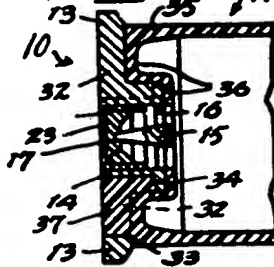


Fig. 11.

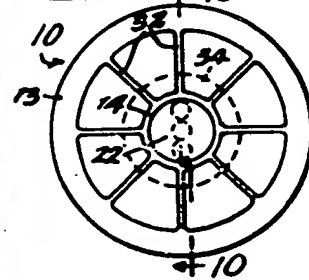


Fig. 14.

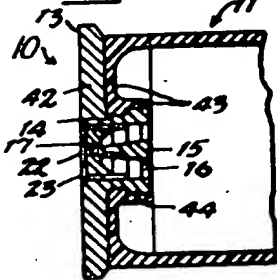


Fig. 15.

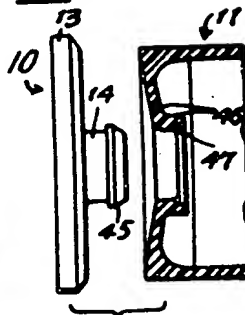


Fig. 16.

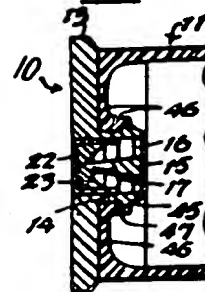


Fig. 17.

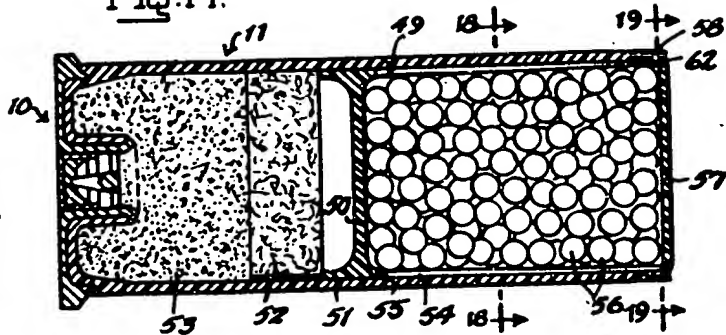


Fig. 18.

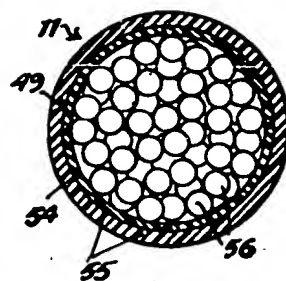


Fig. 19.

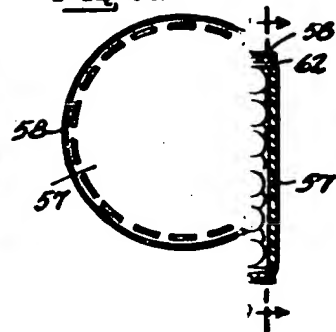


Fig. 20.



Fig. 21.

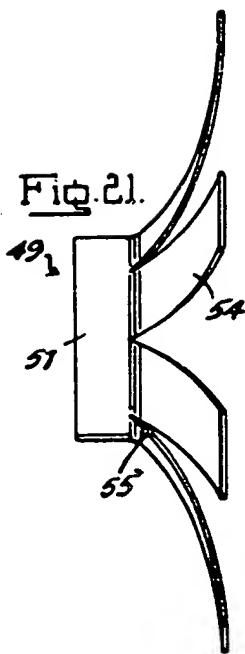


Fig. 22.

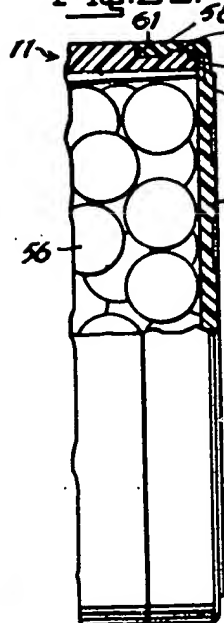


Fig. 23.

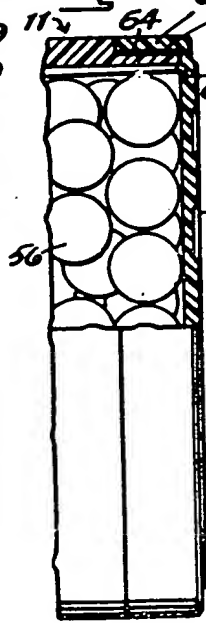


Fig. 24.

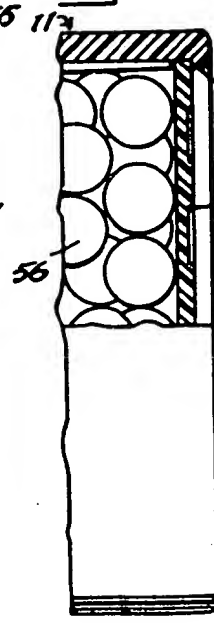
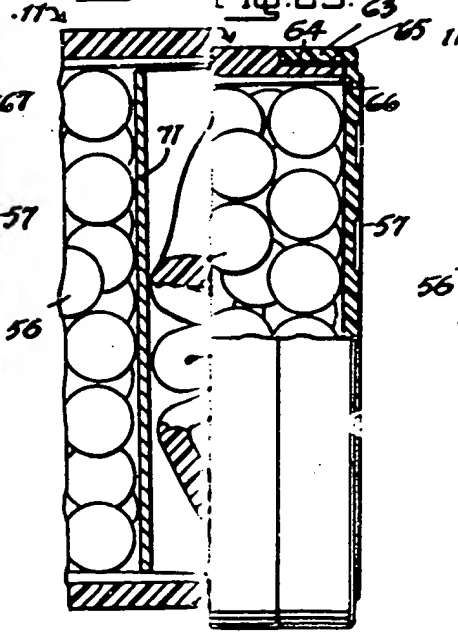
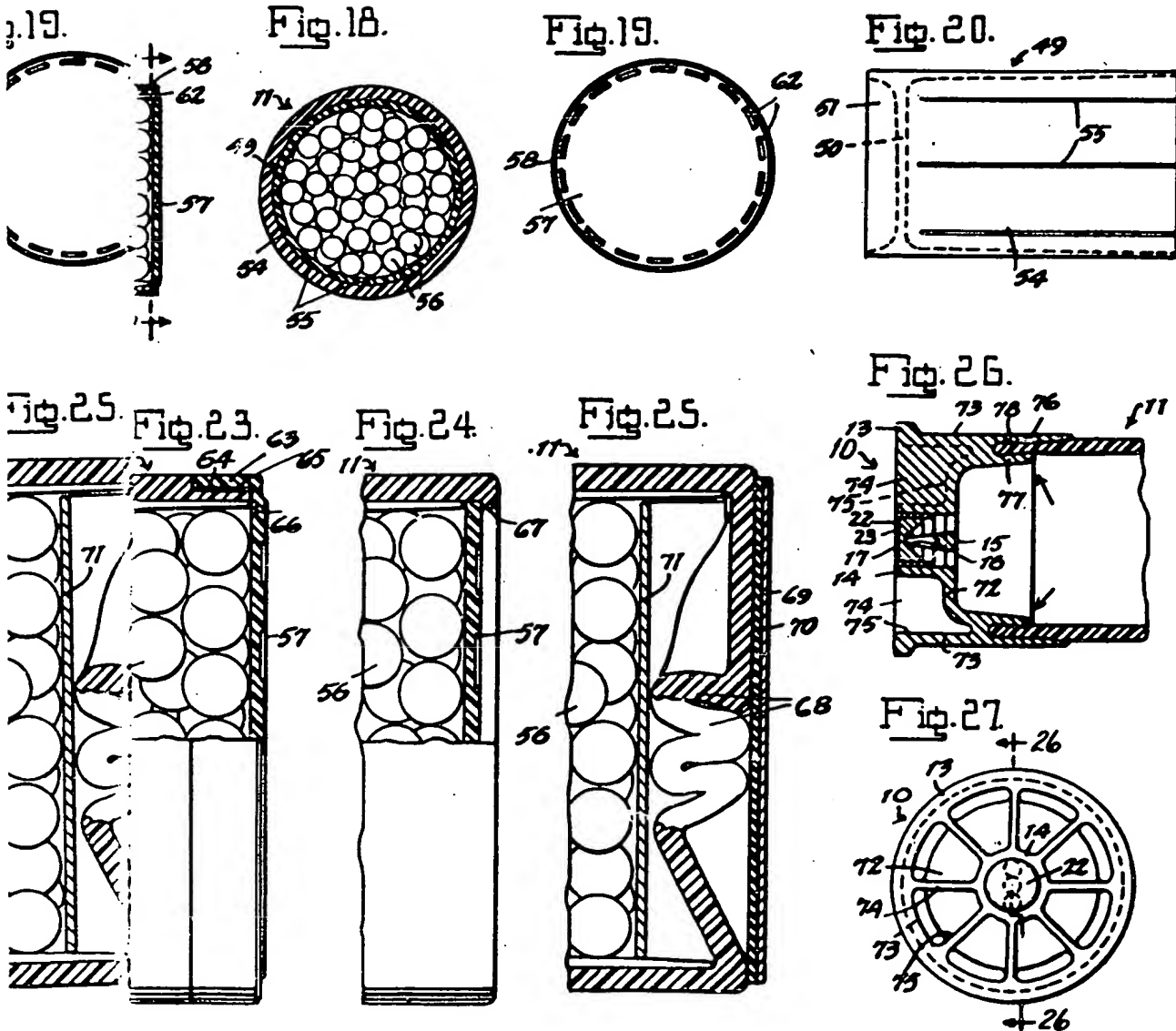
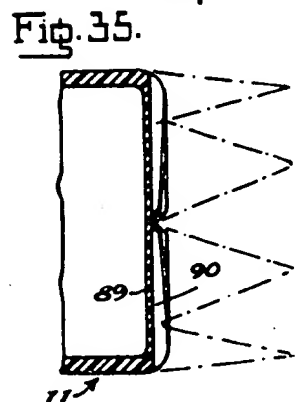
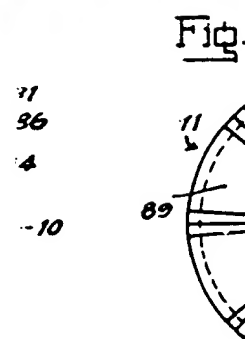
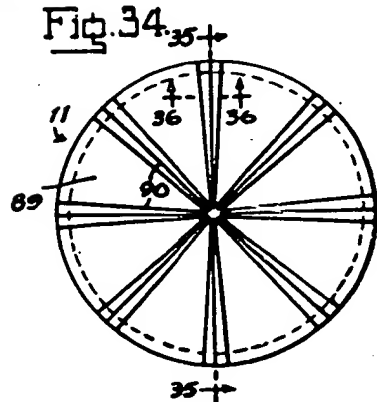
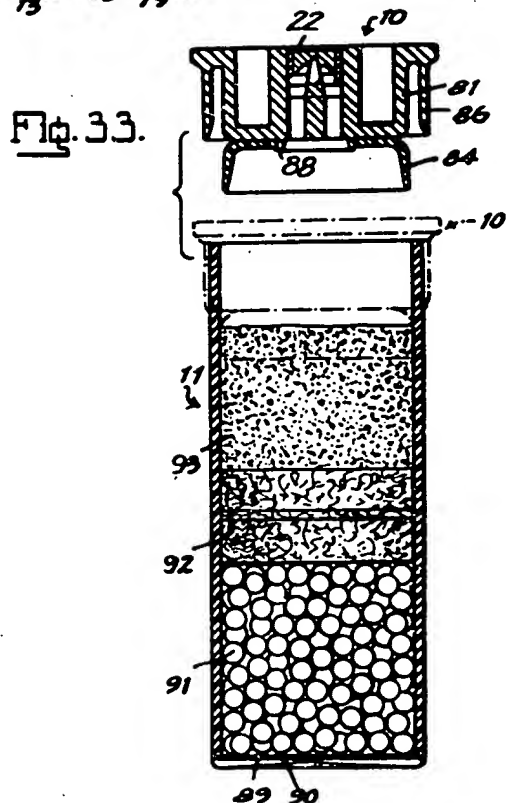
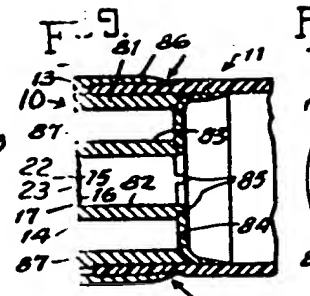
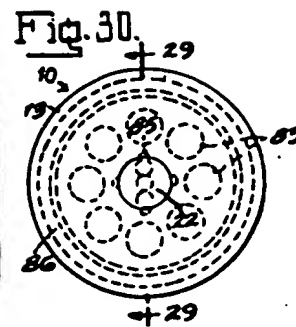
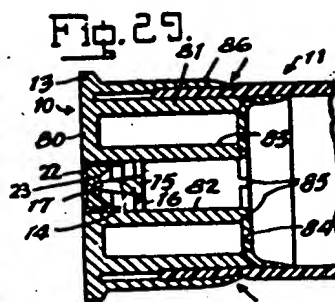
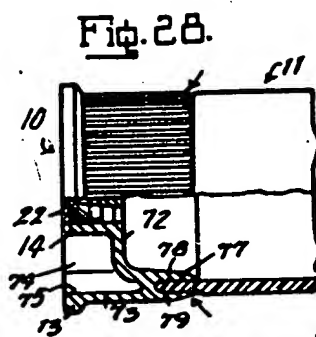


Fig. 25.



1,015,516 COMPLETE SPECIFICATION
4 SHEETS
This drawing is a reproduction of
the Original on a reduced scale.
SHEET 2





1,015,516 COMPLETE SPECIFICATION

4 SHEETS

This drawing is a reproduction of the Original on a reduced scale.

SHEET 3

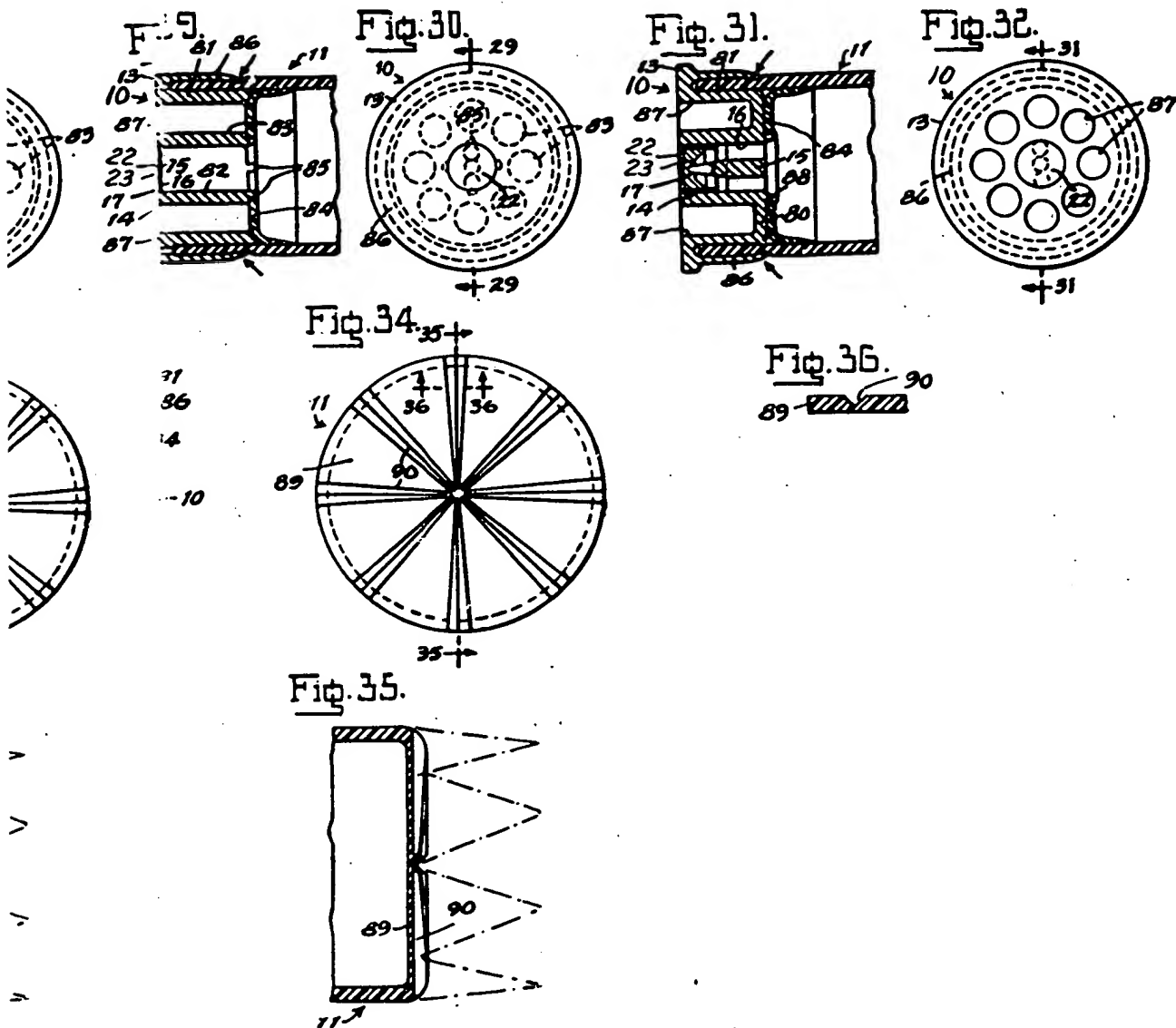


Fig. 37.

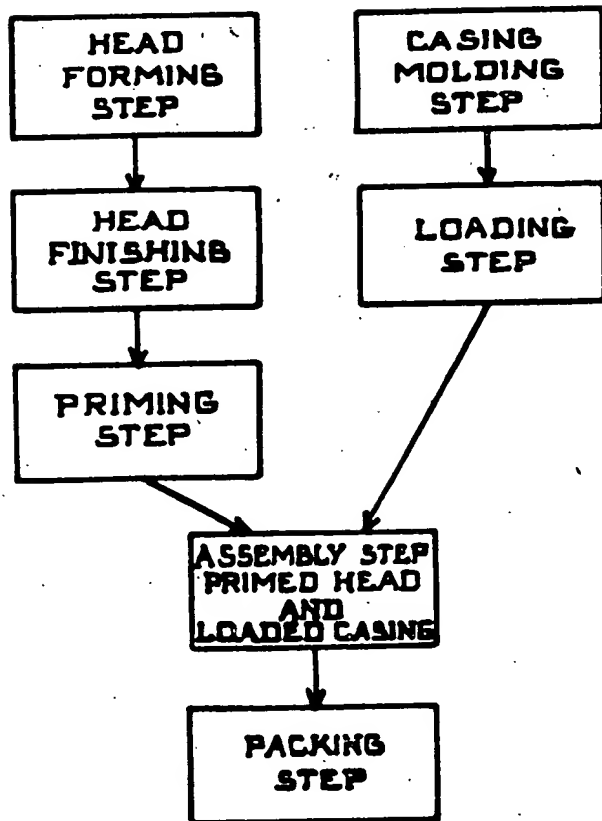


Fig. 38.

